

BIOLOGY AND BEHAVIOUR OF THE WILD GOAT AND THE URIAL AT A WATER POINT IN KIRTHAR NATIONAL PARK, PAKISTAN¹

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(With two text-figures)

The biology and behaviour of the wild goat (*Capra aegargrus*) and the urial (*Ovis orientalis* Gmelin) at a water point in Kirthar National Park were studied from 21 March to 21 May 1986. The water point was observed for a total of 416 hours during 32 days. Thirty-four wild goats and 8 urial were captured and marked for individual identification. Average group sizes of wild goats and urial were 18.8 and 3.8 respectively. Only 49% of the wild goat and 36% of the urial groups that approached water actually drank. The mean number of wild goats visiting the water point per day increased from March through May. Wild goats showed no preference for time of the day during which they visited the water point, but the majority of the urial visits occurred in the late afternoon and early evening. The behaviour of both species as they approached the water point is described. The management implications of the results are discussed. Water points that are developed in arid regions to benefit wild goats and sheep should have reservoirs which will provide sufficient water under drought conditions. The security of the 2 species should be considered when locating water developments.

INTRODUCTION

Kirthar National Park was created in 1974 for the preservation of wild goats and the urial, but it had been a game reserve with restricted hunting since 1930 (Stockley 1936). With the exception of brief studies by Schaller (1977, 1979) and natural history notes by Roberts (1967), little is known about the ecology and biology of these two species in Pakistan.

Kirthar National Park is an arid desert environment in which water is probably a limiting resource for animal populations. The purpose of this paper is to examine aspects of biology and behaviour of wild goats and the urial around a water point in the Karchat Hills of Kirthar National Park.

STUDY AREA

Kirthar National Park is located in the south-western portion of Sind Province, Pakistan, and is 150 km northeast of Karachi, between latitudes 25°10'N and 26°05'N and longitudes 67°10'E and 67°55'E. The western border is formed by the

Baluchistan provincial boundary and the eastern by the Surjan, Sumbak, and Hothiano Game Reserves. The mean maximum and mean minimum temperatures from March through May were 27°C and 38°C respectively. No weather station was maintained in the park, but local residents reported that there had been very little rainfall for two years. The 308,733 ha. area encompasses the Karchat Hills, of which Schaller and Laurie (1974) give a detailed description. Janko water point is located in the southern portion of the Karchat Hills. This natural permanent spring occurs in a wooded dry wash, running north to south, bounded by limestone cliffs on either side which widen at the vicinity of the water point. Water collects in a series of pools formed from natural depressions in the limestone bedrock in combination with concrete that was added to increase the capacity of the pools.

Most of the water is held in 3 main pools, each approximately 1.5 m in diameter and 20–30 cm deep when full, with an approximate capacity of 400 litres. These lie directly under the eastern cliff face, which is 6–7 m high at that point. Water flows into the upper two pools from fissures in the cliff base at approximately 10 litres per hour. Seven metres to the north of the pools is a seep area where a small amount of water collects in shallow depressions in the bedrock. One additional small pool lies 11 m north of the seep; it is about 60 cm in diameter and 10 cm deep, and holds about 30 litres when full. The east cliff wall reaches a high point of 10 m just north of this pool; this slopes gently to the east and

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provides a good overlook of the waterholes. We refer to this as the staging area. A ridge runs parallel to, and east of the wash. Seventy metres east of the staging area, the ridge is topped by a distinctive layer of rocks which we called the rimrock. A shaded area referred to as the cave is found under the east cliff where the wash makes a bend towards the west, 200 m north of the water point. Another ridge runs parallel to the first, on the west side of the wash; a permanent rock and a thatch *machan* is located near the top and is 66 m southwest of the waterholes.

METHODS

Wild goats and the urial were observed with 10 x binoculars or a 15-35 x spotting scope. Observations at the water point were made from the *machan*. Systematic surveys were conducted at weekly intervals throughout the southern third of the Karchat Hills. Goats and urial were captured with a remotely fired net-gun aimed at the upper waterhole, or with two Aldridge leg-hold snares placed around the lower waterholes. Sex and age of each captured animal was determined, and plastic ear tags, numbered and colour-coded for individual identification, were placed in each ear. The lead animal in a group was the focal animal used for timed events. Age classifications followed Schaller (1977). Differences in sample means were determined by use of T-test, and correlation analysis was used to test the relationship between group size and time required to reach the water point.

RESULTS

We watched the Janko water point for a total of 416 hours, over 32 days of dawn to dusk observations, between 21 March and 21 May 1986. During this period, we captured and marked 34 wild goats (26 females and 8 males), 10 in snares, and 24 with a net-gun. Eight urial (4 males and 4 females) were captured with the net-gun.

Wild Goats

One hundred and fifty-two groups of wild goats approached the water point during our observations, but only 75 (49%) of these actually drank. The adult female-young ratio in May was 100:27. The mean size of the 152 groups was 18.8 (S.D. = 22.8) and was significantly larger ($t = 3.38, P < 0.01$) than the group size ($X = 10.4, S.D. = 11.9$) of wild

goats observed away from the water point. The mean number of wild goats drinking from the water point increased from March through May (Fig. 1). Wild goats approached the waterhole throughout the day (Fig. 2) with no apparent preference for any time period.

Wild goats used three main routes when approaching the water point. The majority of groups (79.9%) approached the water by moving from the rimrock directly to the staging area and from there down the cliff face to the water. The second route, used 8.6% of the time, involved moving from the rimrock down to the cave in the cliff face, then along the top or bottom of the cliff to the staging area, and then to the water. This route was used primarily during midday, apparently because the cave and cliff face provided shade. The third route was used 6.7% of the time, mostly by male groups. This route began at the far end of the east cliff; the goats walked along the top of the cliff and either stopped at the cave, or continued along the top of the cliff to the staging area. Several other routes were used 4.8% of the time, with animals approaching the water from along the west cliff or down the wash.

Regardless of the route, wild goats approached the water cautiously and remained alert throughout their approach. The average time from when they were first seen until they reached the water was 58 minutes (S.D. = 43.7), and was not related to group size ($r = 0.20, P > 0.1$). Goats would stand or bed down at various places along each route, and often 30 minutes or more was spent at the staging area above the water. Lactating females and young were usually the first to drink. However, once 1 or 2 animals reached the water, the majority of the group would rapidly follow. Once at the water, wild goats drank quickly, rarely spending more than two minutes drinking. Based upon the number of goats that drank from a basin of known volume, adult females consumed approximately 5.5 litre of water. This represents 17% of the average weight of an adult female ($n = 20$). Once an animal finished drinking, it moved away from the water point at a steady pace, usually towards and over the rimrock, and out of sight to the east.

Eighteen marked goats were observed approaching the water point 117 times. Individual marked goats returned to the water point every 1.7 days. Because the number of consecutive days we

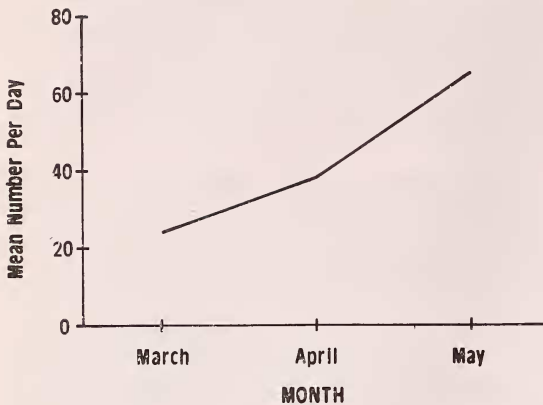


Fig. 1. Mean number of wild goats drinking water per day at Janko waterpoint, by month.

watched the water point rarely exceeded 5 days, this estimate is probably biased on the low side. Every 3 days is probably a more realistic estimate.

Urial

Twenty-eight groups of urial approached the water point during our observations, but only 36% of these drank. Average size of urial groups at the water point ($X = 3.8$, $S.D. = 2.88$) did not differ ($t = 0.945$, $P = 0.1$) from 14 groups observed away from the water point ($X = 4.7$, $S.D. = 2.9$). In May, the adult female-young ratio was 100:53.

Urial approached the water point from several different routes, but 70% of all approaches were directly down the wash. The average time from first observation until drinking was 50 minutes ($S.D. = 52.6$). This value is not directly comparable to the average approach time for wild goats because the route, down the wash, taken by the majority of urial, kept them out of view until they were 30 m from the water. It was our impression that urial were much more wary than the wild goats when approaching the water point. Urial approached the water primarily in the late afternoon and early evening.

Interspecific Behaviour

Interspecific behaviour was noted on seven occasions during our observations. These resulted in physical contact twice. A class IV male goat butted a class IV male urial in the ribs, pushing him down from a 3 m cliff. The urial ran rapidly off, but apparently was not injured. The second physical con-

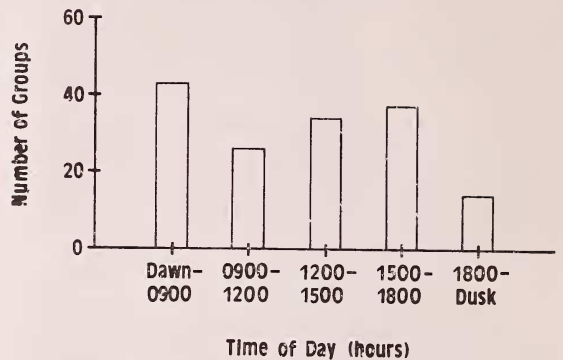


Fig. 2. Time of day of visits by wild goat groups to Janko waterpoint, March through May 1986.

tact between the two species occurred when an adult female goat threatened a young urial with a head-down display. An adult female urial immediately turned and butted heads with the goat, after which they both walked away. The other five interactions resulted in the urial being displaced by either head-down threats or stiff-legged approaches by goats. In one case, a class IV adult male urial was displaced by an adult female goat.

DISCUSSION

The importance of water to wild goats and urial in the desert habitat of Kirthar National Park cannot be overstated. Water was especially important to wild goats during our study because the Janko water point was the only permanent water available within the herd's home range after two years of drought. The urial were probably just as dependent upon free water, but our observations do not bear this out because other sources of water were available to urial. A small water point 400 m south of the Janko water point was used by urial, but not by wild goats, apparently because of the lack of steep escape topography. The urial in this area were also reported by local game watchers to use a small stream on the plains, 5 km west of the Janko water point, but we were unable to verify that claim.

Individual wild goats visited the Janko water point every 2 to 3 days, and lactating females and young appeared to be the most dependent upon free water. Herd productivity may be directly related to

the availability of water. Roberts (1967) and Schaller and Laurie (1974) both reported that natality was highest during years following a rut which occurred after abundant rainfall. Schaller (1979) also suspected that survival of young may be low during years of drought because of poor nutrition. We believe that survival of young may also be dependent upon the availability of free water. The low adult female-young ratio (100:27) observed by us was probably directly related to drought conditions. The higher female-young ratio (100:53) for urial may reflect a better adaptation to drought conditions. Population size of desert bighorn sheep in the United States is limited by the distribution of water (Welles and Welles 1961, Russo 1956, and Hansen 1965). Leslie and Douglas (1979) reported that desert bighorn ewes in the River Mountains of Nevada restricted their movements and showed a high degree of fidelity to water sources.

During drought years the demand for free water may exceed the supply; mortality would therefore be expected to increase. Based upon our rate of flow estimates for the springs at Janko water point, the average number of wild goats drinking per day, and our estimated consumption of water per animal, by May the demand for water exceeded the rate of flow. During May, the reservoir of water in the pools dropped noticeably and was severely depleted on several occasions. This condition demonstrates the need for construction of reservoirs whose capacity exceeds demands under the most severe drought conditions. Use of these sites by domestic livestock should be discouraged.

Both the urial and wild goats approach the Janko water point very cautiously. This behaviour is

normal and probably reflects a relatively high potential for predation when animals are concentrated around a water point. During our observations, wild goats and urial were scared away from the water point 8 times by jackals (*Canis aureus*) and twice by domestic dogs (*Canis familiaris*). On one occasion a jackal killed a young wild goat. Thus, when constructing future water catchments for wild goats and urial, the animals' security must be considered. However, what is considered safe by one species may not be by the other. The cliffs surrounding the Janko water point, which make the site attractive for wild goats, may be a reason the water point is rarely used by urial. Desert bighorn sheep in North America prefer open space around water points to enable them to spot potential danger (Hansen 1980). The urial probably has a similar preference, but this needs to be examined further.

The interspecific encounters we observed indicate that urial almost always defer to wild goats. This behaviour, especially at water points during drought conditions, may give wild goats a competitive advantage over urial. This again emphasizes the need for water points of sufficient capacity to meet the requirements of all wildlife species.

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REFERENCES

- HANSEN, C.G. (1965): Management units and bighorn sheep herds on the Desert Game Range, Nevada. *Desert Bighorn Council Trans.* 9: 11-14.
- (1980): Habitat. Pages 64-79 in G. Monson and L. Sumner, eds., *The desert bighorn: Its life history, ecology, and management*. Univ. of Arizona Press, Tucson. 370 pp.
- LESLIE, JR., D.M. & DOUGLAS, C.L. (1979): Desert bighorn sheep of the River Mountains, Nevada. *Wildl. Monogr.* 66: 56 pp.
- ROBERTS, T.J. (1967): A note on *Capra hircus blythi* Hume, 1875. *J. Bombay nat. Hist. Soc.* 64: 358-365.
- RUSSO, J.P. (1956): The desert bighorn sheep in Arizona. *Ariz. Game and Fish Dept. Wildl. Bull.* No. 1. 153 pp.
- SCHALLER, G.B. (1977): Mountain monarchs: Wild sheep and goats of the Himalaya. The Univ. of Chicago Press, Chicago. 425
- (1979): Ecology and behavior of high-altitude mammals in South Asia. *Natl. Geog. Soc. Res. Rep.*, 1979 Projects. 461-478 p.
- SCHALLER, G.B. & LAURIE, A. (1974): Courtship behavior of the wild goat. *Z. Säugetierkunde* 39: 115-127.
- STOCKLEY, C.H. (1936): *Stalking in the Himalayas and Northern India*. Herbert Jenkins Ltd., London.
- WELLES, R.E. & WELLES, F.B. (1961): The bighorn of Death Valley. *U.S. Natl. Park Serv. Fauna Series* No. 6. Washington D.C. 242 pp.